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detritus agitated by the waves. The waves and undertow move the shallow water near the shore rapidly to and fro, and in so doing momentarily lift some particles, and roll others forward and back. The particles thus wholly or partially sustained by the water are at the same moment carried in a direction parallel to the shore by the shore current. The shore current is nearly always gentle and has of itself no power to move detritus" (*U. S. Geol. Surv.*, Monogr. i, 37). Tarr describes 'Shore currents of wind drift origin' in Cayuga Lake, and Woodman recognizes in the Bras D'Or Lakes, 'currents caused by the unobstructed forward movement of the top water under wave growth and motion, and lasting little if any time after the cessation of the wind.' It is precisely these currents which Gilbert and Gulliver seem to have had in mind as determining the direction of 'long shore transportation of gravel and sand, jostled by the waves. All may agree with a later writer that "one will never find [these] currents of sufficient power to transport pebbles,' if the currents are considered apart from the waves; but some might not agree with another writer that such currents should be classed 'under the general head of wave action.' Certainly it is by wave action that a cobble is thrown upon the beach; but the systematic forms assumed by cusps and bars, of which the beach is but the higher part, suggests a control by the slow movement of a large body of water. The similarity between large cusps, such as Capes Lookout and Hatteras where the action of 'long-shore currents can hardly be doubted, and the small forms of the Bras D'Or lakes where the 'long-shore currents must be very weak, suggests that the processes of origin should be similarly analyzed for both large and small forms.

GLACIAL EROSION IN THE GREAT GLEN OF SCOTLAND.

W. T. BLANFORD, veteran geologist of India, writing "On a particular form of surface, apparently the result of glacial erosion, seen on Loch Lochy and elsewhere" (*Quart. Journ. Geol. Soc.*, lvi, 1900, 198-204), suggests that glacial action has strongly deepened the floor and smoothed the sides of the Great glen of

Scotland. It is inferred that in preglacial time the streams of lateral glens were separated by advancing spurs which buttressed the sides of the Great glen. Now the spurs seem to have been truncated, producing the smooth and even sides of the glen, to which attention is especially directed. The lateral glens at present open 1000 feet above the floor of the Great glen, whose smoothed sides are very little eroded by the descending tributary streams. The change from the inferred preglacial form is taken to indicate glacial erosion of at least 250 or 300 feet of rock.

Main valleys thus affected by glacial erosion are called 'over-deepened valleys' by Penck, because they frequently contain lakes, and because their slope is often so gentle that the streams which now occupy them must aggrade their floor. The lateral valleys that open in the wall of the main valley at a considerable height above its floor, so that the side streams cascade into the main valleys, are called 'hanging valleys' by Gilbert, who has described many examples in an address on the Harriman Alaskan expedition (not yet published). Gannett has clearly explained the relation of hanging side valleys to their overdeepened main valleys in his account of Lake Chelan (*Nat. Geogr. Mag.*, ix., 1898, 417-428), in which the analogy between the valleys and beds of rivers and glaciers was clearly pointed out in terms very similar to those independently stated by Penck a year later (see SCIENCE, January 5, 1900, 34). An account of the overdeepened valleys of the Ticino in the Southern Alps is given by the undersigned in *Appalachia*, ix, 1900, 136-156.

W. M. DAVIS.

ANTIQUITIES OF ALABAMA.

'CERTAIN Aboriginal Remains of the Alabama River,' is the title of a paper by Mr. Clarence B. Moore, of Philadelphia. This memoir occupies pages 289 to 347 of Volume XI., 1899, of the *Journal of the Academy of Natural Sciences* of Philadelphia and is also issued as a bound reprint of same date. P. C. Stockhausen, the publisher, has left us nothing to wish for in paper and imprint. Sixty-nine illustrations of pottery, shell, stone and copper objects, a

map of the Mobile and Alabama river region and an index accompany the text.

Some of the copper pendants figured are of exceeding interest. Pipes of earthenware, fish-hooks of shell and bone, disks probably for the ear lobe, incised shell disks and the decoration on the pottery are all worthy of study.

The author states that although the attention given by him to the Mobile and Alabama rivers does not compare with that accorded by him to the St. Johns river, Florida, and to the Georgia coast, yet it was fully ample to indicate that mounds along these rivers were of rare occurrence and, as a rule, insignificant in size. He suspects that at many places the people were buried in cemeteries and that these being unmarked have largely escaped notice. The borders of Mobile and Alabama rivers were probably not so thickly settled as the St. Johns. This may be due to the fact that shad, bass and shell-fish are less abundant in the former. The shellheaps are insignificant compared with those covering acres along the St. Johns. Swamps and malaria may also have had their influence.

Quartz is more used than chert for points, a reverse of the facts for Florida and Georgia coast. The earthenware, although good and often tempered with shell, was not striking in type. In some of it Tennessee and Mississippi Valley influence is suggested.

The gritty ware of lower Georgia and its complicated stamp decorations were rare, but some sherds bearing decorations of the kind found in Georgia, Carolina and upper Florida were found. None of the highest type of gulf-ware was met and perforations for suspension were not common.

Plural burials of uncremated bones in single urns proved a fact new to science for the south-east, although plural burials of cremated bones may have been known. One case of cremation was found which, while almost totally foreign to this region, is frequently met in Florida and Georgia.

Mr. Moore's investigations are the first of a systematic nature to be carried on along the Mobile and the Alabama. This record of the results is a most happy addition to the already valuable Floridian library from his pen.

HARLAN I. SMITH.

A NEW PALEOLITHIC STATION.

A DISCOVERY of unusual importance is announced in the *Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* for March. The announcement, as well as the discovery, is by Professor Gorjanović-Kramberger, Director of the National Museum of Geology and Paleontology at Agram, capital of Croatia, Austria-Hungary. The find was made on the bank of the Krapina, a small stream in northern Croatia, and consists of the paleolithic remains of man (pieces of the jaw bone with teeth, isolated teeth, parietal and occipital fragments, etc.), and chipped implements of stone, associated with *Rhinoceros tichorhinus*, *Bos primigenius*, *Ursus spelæus*, *Sus*, *Castor fiber*, etc.

These culture-bearing deposits, nine zones in all, occur in what might be called a rock shelter of stratified Miocene sandstone. Of the nine zones, the lowest only shows evidence of stream-action, and that at a time when the water-level was considerably higher than now. The eight superimposed layers are products of weathering from the overhanging Miocene sandstone. The thickness of the entire deposit measures 8.5 meters. The above mentioned animal remains occur throughout the series of layers, at the same time, on account of the relative frequency of certain remains, three faunal horizons are readily determined:

- 1 *Castor fiber*,
- 3-4 *Homo sapiens*,
- 9 *Ursus spelæus*.

It is pointed out that horizon 3-4 contains burnt human as well as animal bones. The bones are bright yellow and very friable, the phalanges and teeth alone being well preserved. The station has produced in all, more than one thousand fragments of bone. Unfortunately, the preliminary report gives little idea as to the character of the industry except to say that the implements are angular pieces of jasper and opal.

The appearance of charcoal, ashes, burnt sand, stone implements and bone fragments all the way from the second to the ninth and top-most layer, and the relatively large proportion of the human to the animal remains, will tend to increase the interest in Dr. Gorjanović-Kram-